Editorial

New Trends in Photochemical Engineering and Technologies

Karine Loubiere

Michael Oelgem ller

In recognition of the importance of light science and its applications, the UN General Assembly proclaimed 2015 as the International Year of Light and Light-Based Technologies (IYL). The IYL raised awareness on how light-based technologies can promote sustainable development and provide solutions to current and future global challenges (www.light2015.org/Home.html). Light plays a crucial role in our daily lives and finds broad applications in chemical synthesis, physical processes, environmental management, and energy generation (among others).

This special issue highlights new trends in photochemical engineering and technologies. It covers new photoreactor systems and light sources, photoreactor modelling, photochemical methodologies, and photoactive materials. It comprises five review papers and thirteen research papers from research groups from across the globe.

Strehmel and co-workers present a review on digital imaging of lithographic materials by radical photopolymerization and photonic baking with NIR diode lasers. Lacombe and colleagues describe reactors and materials used in gas-phase photooxidations for air treatment. Lomaev et al. review excilamps and their applications in photochemistry. De Lasa evaluates photocatalytic efficiency using quantum yields and the photochemical thermodynamic efficiency factor. Photochemical fluorination reactions in continuous flow are summarized by Rehm. Oelgemöller and co-workers use an advanced continuous flow-reactor for selected photodecarboxylation reactions, including the synthesis of a biological active target compound via a photo-thermal tandem process. Liu and colleagues describe a planar photocatalytic microreactor and evaluate its efficiency to degrade methylene blue. The group of Li utilizes a microwave discharge electrodeless lamp in combination with H_2O_2 for the photooxidation of guaiacol to valuable carboxylic acids. Horikoshi and co-workers examine solar cell-powered microwave discharge electrodeless lamps for continuous on-site field treatment of contaminated water. Computational fluid dynamics is used by Deng to evaluate radiation fields and disinfection in UV reactors. Loubiere and her team combine modelling and experiments in a spiral-shaped LED-driven microreactor to acquire kinetic data on a photochemical system. Likewise, Ziegenbalg and colleagues investigate photon fluxes inside microstructured photoreactors to reveal further optimization potential for these devices. Ponce-de-Leon et al. report the construction of a photocatalytic flow reactor for the oxidation of methyl orange. Taghipour and Adeli report on a GaN:ZnO-reduced graphene oxide composite that exhibits an improved activity for overall water splitting. CdS and Ag/CdS nanoparticles used for photocatalytic azo dye degradation are described by Fazaeli and co-workers. Hermosilla et al. study the effects of carbonates on TiO_2-photocatalysis and photo-Fenton processes. Likewise, Ballari and colleagues use a commercially available TiO_2 photocatalyst doped with carbon for the degradation of the important air pollutant acetaldehyde. Finally, semiconductor light sources are successfully used by Landgraf for time-resolved fluorescence HPLC detection. These recent advances in applied photochemistry and photochemical engineering clearly demonstrate the potential and importance of light.

We would like to thank all colleagues and friends who have contributed to the success of this special issue.

Michael Oelgemöller
College of Science, Technology and Engineering, James Cook University, Townsville, Qld 4811, Australia

Karine Loubiere
Université de Toulouse, INPT, CNRS, Laboratoire de Génie Chimique (LGC UMR 5503), 4 allée Emile Monso, BP 84234, 31432 Toulouse, France